

2,4-Dinitrophenol; CASRN 51-28-5

Human health assessment information on a chemical substance is included in the IRIS database only after a comprehensive review of toxicity data, as outlined in the [IRIS assessment development process](#). Sections I (Health Hazard Assessments for Noncarcinogenic Effects) and II (Carcinogenicity Assessment for Lifetime Exposure) present the conclusions that were reached during the assessment development process. Supporting information and explanations of the methods used to derive the values given in IRIS are provided in the [guidance documents located on the IRIS website](#).

STATUS OF DATA FOR 2,4-Dinitrophenol

File First On-Line 03/31/1987

Category (section)	Assessment Available?	Last Revised
Oral RfD (I.A.)	yes	03/31/1987*
Inhalation RfC (I.B.)	message	10/01/1991*
Carcinogenicity Assessment (II.)	not evaluated	

*A comprehensive review of toxicological studies was completed (05/27/05) - please see sections I.A.6. and I.B. for more information.

I. Chronic Health Hazard Assessments for Noncarcinogenic Effects

I.A. Reference Dose for Chronic Oral Exposure (RfD)

Substance Name — 2,4-Dinitrophenol

CASRN — 51-28-5

Last Revised — 03/31/1987

The oral Reference Dose (RfD) is based on the assumption that thresholds exist for certain toxic effects such as cellular necrosis. It is expressed in units of mg/kg-day. In general, the RfD is an estimate (with uncertainty spanning perhaps an order of magnitude) of a daily exposure to the human population (including sensitive subgroups) that is likely to be without an appreciable risk

of deleterious effects during a lifetime. Please refer to the Background Document for an elaboration of these concepts. RfDs can also be derived for the noncarcinogenic health effects of substances that are also carcinogens. Therefore, it is essential to refer to other sources of information concerning the carcinogenicity of this substance. If the U.S. EPA has evaluated this substance for potential human carcinogenicity, a summary of that evaluation will be contained in Section II of this file.

NOTE: The Oral RfD for 2,4-dinitrophenol may change in the near future pending the outcome of a further review now being conducted by the RfD/RfC Work Group.

I.A.1. Oral RfD Summary

Critical Effect	Experimental Doses*	UF	MF	RfD
Cataract formation	NOEL: none	1000	1	2E-3 mg/kg/day
Human Chronic and Subchronic Exposures	LOAEL: 2 mg/kg/day			
Horner, 1942				

*Conversion Factors -- none

I.A.2. Principal and Supporting Studies (Oral RfD)

Horner, W.D. 1942. Dinitrophenol and its relation to formation of cataracts. Arch. Ophthal. 27: 1097.

Over 100 anecdotal cases of cataracts resulting from therapeutic use of 2,4- dinitrophenol were reviewed. The length of time and amount of drug taken varied among the population. It was estimated that over 1% of the population administered 2,4-dinitrophenol developed cataracts. Data did not allow for calculation of a NOEL; cataracts were observed in patients receiving as little as 2 mg/kg/day, the lower range of the recommended therapeutic dose.

In the Ambient Water Quality Criteria Document for Nitrophenols (U.S. EPA, 1980), an ADI was also calculated based on a 6-month feeding study in rats administered five dietary levels of 2,4-dinitrophenol (Spencer et al., 1948). A NOEL between 5.4 mg/kg and 20 mg/kg was

demonstrated. If one uses the lower figure of 5.4 mg/kg and an uncertainty factor of 1000, the resulting RfD of 0.005 is comparable to that determined from the human data.

I.A.3. Uncertainty and Modifying Factors (Oral RfD)

UF — The UF of 1000 includes uncertainties in the following areas: extrapolation of an approximately subchronic exposure to chronic exposure, the range of human sensitivity, and extrapolation from a LOAEL to a hypothetical no-effect level.

MF — None

I.A.4. Additional Studies/Comments (Oral RfD)

Embryotoxicity, but not teratogenicity, was observed in mice treated with doses of 2,4-dinitrophenol producing overt signs of toxicity (Gibson, 1973).

I.A.5. Confidence in the Oral RfD

Study — Low
Database — Low
RfD — Low

Since the chosen study only describes anecdotal data and the supporting data base is meager, the confidences in the chosen study, database and RfD are rated low.

I.A.6. EPA Documentation and Review of the Oral RfD

Source Document — This assessment is not presented in any existing U.S. EPA document.

Other EPA Documentation — U.S. EPA, 1980

Agency Work Group Review — 11/06/1985, 02/05/1986

Verification Date — 02/05/1986

A comprehensive review of toxicological studies published through May 2005 was conducted. No new health effects data were identified that would be directly useful in the revision of the existing RfD for 2,4-Dinitrophenol and a change in the RfD is not warranted at this time. For more information, IRIS users may contact the IRIS Hotline at hotline.iris@epa.gov or 202-566-1676.

I.A.7. EPA Contacts (Oral RfD)

Please contact the IRIS Hotline for all questions concerning this assessment or IRIS, in general, at (202)566-1676 (phone), (202)566-1749 (FAX) or hotline.iris@epa.gov (internet address).

I.B. Reference Concentration for Chronic Inhalation Exposure (RfC)

Substance Name — 2,4-Dinitrophenol
CASRN — 51-28-5

The health effects data for 2,4-dinitrophenol were reviewed by the U.S. EPA RfD/RfC Work Group and determined to be inadequate for the derivation of an inhalation RfC. For additional information on the health effects of this chemical, interested parties are referred to the documentation listed below.

U.S. EPA. 1980. Ambient Water Quality Criteria Document for Nitrophenols. Prepared by the Office of Health and Environmental Assessment, Environmental Criteria and Assessment Office, Cincinnati, OH for the Office of Water Regulations and Standards, Criteria and Standards Division, Washington, DC. EPA 440/5-80-063.

U.S. EPA. 1984. Health and Environmental Effects Profile for Dinitrophenols (Selected). Prepared by the Office of Health and Environmental Assessment, Environmental Criteria and Assessment Office, Cincinnati, OH for the Office of Solid Waste and Emergency Response, Washington, DC.

Agency Work Group Review — 06/13/1991

EPA Contacts:

Please contact the IRIS Hotline for all questions concerning this assessment or IRIS, in general, at (202)566-1676 (phone), (202)566-1749 (FAX) or hotline.iris@epa.gov (internet address).

A comprehensive review of toxicological studies published through May 2005 indicated that there is insufficient health effects data to derive an RfC for 2,4-Dinitrophenol at this time. For more information, IRIS users may contact the IRIS Hotline at hotline.iris@epa.gov or 202-566-1676.

II. Carcinogenicity Assessment for Lifetime Exposure

Substance Name — 2,4-Dinitrophenol
CASRN — 51-28-5

This substance/agent has not undergone a complete evaluation and determination under US EPA's IRIS program for evidence of human carcinogenic potential.

III. [reserved]

IV. [reserved]

V. [reserved]

VI. Bibliography

Substance Name — 2,4-Dinitrophenol
CASRN — 51-28-5

VI.A. Oral RfD References

Gibson, J.E. 1973. Teratology studies in mice with 2-secbutyl-4, 6- dinitrophenol (dinoseb). Food Cosmet. Toxicol. 11: 31.

Horner, W.D. 1942. Dinitrophenol and its relation to formation of cataracts. Arch. Ophthal. 27: 1097.

Spencer, H.C., V.K. Rowe, E.M. Adams and D.D. Irish. 1948. Toxicological studies on laboratory animals of certain alkyl dinitrophenols used in agriculture. J. Ind. Hyg. Toxicol. 30: 10-25.

U.S. EPA. 1980. Ambient Water Quality Criteria Document for Nitrophenols. Prepared by the Office of Health and Environmental Assessment, Environmental Criteria and Assessment Office for the Office of Water Regulations and Standards, Criteria and Standards Division, Washington, DC.

VI.B. Inhalation RfD References

U.S. EPA. 1980. Ambient Water Quality Criteria Document for Nitrophenols. Prepared by the Office of Health and Environmental Assessment, Environmental Criteria and Assessment Office, Cincinnati, OH for the Office of Water Regulations and Standards, Criteria and Standards Division, Washington, DC. EPA 440/5-80-063.

U.S. EPA. 1984. Health and Environmental Effects Profile for Dinitrophenols (Selected). Prepared by the Office of Health and Environmental Assessment, Environmental Criteria and Assessment Office, Cincinnati, OH for the Office of Solid Waste and Emergency Response, Washington, DC.

VI.C. Carcinogenicity Assessment References

None

VII. Revision History

Substance Name — 2,4-Dinitrophenol
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Date	Section	Description
10/01/1991	I.B.	Inhalation RfC message on-line
10/28/2003	I.A.6., I.B.	Screening-Level Literature Review Findings message has been added.
06/22/2005	I.A.6., I.B.	Screening-Level Literature Review Findings message has been removed and replaced by comprehensive literature review conclusions.

VIII. Synonyms

Substance Name — 2,4-Dinitrophenol

CASRN — 51-28-5

Last Revised — 03/31/1987

- 51-28-5
- ALDIFEN
- CHEMOX PE
- 2,4-DINITROFENOL
- DINITROFENOLO
- 2,4-Dinitrophenol
- Dinitrophenol, 2,4-
- alpha-DINITROPHENOL
- 2,4-DNP
- FENOXYL CARBON N
- 1-HYDROXY-2,4-DINITROBENZENE
- MAROXOL-50
- NITRO KLEENUP
- NSC 1532
- PHENOL, 2,4-DINITRO-
- PHENOL, alpha-DINITRO-
- RCRA WASTE NUMBER P048
- SOLFO BLACK 2B SUPRA
- SOLFO BLACK B
- SOLFO BLACK BB
- SOLFO BLACK G
- SOLFO BLACK SB
- TERTROSULPHUR BLACK PB
- TERTROSULPHUR PBR